

Submission Date: Feb 15, 2008

Priority: 1 of 1



Ted Stevens

United States Senator for Alaska

Please Note:

- Fill out one request form for each request
- This form (and any attachments) can be returned via:

Fax - (202) 224-2354

Mail - The Honorable Ted Stevens
United States Senate
522 Hart Senate Office Bldg.
Washington, D.C. 20510

- Requests are due by February 15, 2008.

FISCAL YEAR 2009 PROJECT REQUEST FORM

Project Name: Arctic Technology Research and Development to Support Homeland Security

Project Location: Beaufort and Chukchi Seas in Alaska

Project Description (please attach additional pages as required):

We request funding within the Department of Homeland Security to develop tools and products that can be used by the Alaska Ocean Observing System to meet homeland security and marine navigation safety needs in Alaska's Arctic, for a total cost of \$1 million:

1. Creation of a climatology atlas of the Arctic nearshore region during both the ice and ice-free seasons in order to develop nearshore ocean forecasting for the Chukchi and Beaufort Seas. Cost: \$100k.
2. Purchase and testing of equipment to make substantial improvements to sea ice forecasts by collecting airborne sea ice thickness measurements in the Arctic. Cost: \$300k for equipment and test flights.
3. Construction and testing of an autonomous powered and remotely-controlled High Frequency radar system suitable for use in arctic and sub-arctic locations. Cost: \$600k.

Additional detail follows.

Related Appropriations Bill: Department of Homeland Security

Amount of federal funding requested for FY09: \$1 million

Total funding to complete this project: \$1.6 million

Number of years to fund this project: 1 year

Matching funds from the State of Alaska: 0

Matching funds from local and private entities:

Oil and gas companies have expressed interest in providing logistical support (especially helicopter time) in past proposals.

If this project was funded in prior appropriations bills (within the last five years), list each bill and the amount funded:

NA

Amount included in the President's FY09 Budget: 0

Amount included in the State of Alaska FY09 Budget: 0

☐ Check this box if state funding was sought but not provided.

List legislation that authorizes this project:

Authorized under current Dept of Homeland Security and Coast Guard budget authorizations.

Check all that apply:

- ☐ A change in the current law is necessary in order to proceed with the project. (If so, attach language and a list of laws that need to be amended)
- ☐ Bill or report language is needed. (If so, attach requested language)



Alaska Ocean Observing System
1007 West Third Ave., Suite 100
Anchorage, AK 99501

Arctic Technology Research and Development to Support Homeland Security

The Request

We request funding within the Department of Homeland Security to develop tools and products that can be used by the Alaska Ocean Observing System to meet homeland security and marine navigation safety needs in Alaska's Arctic, for a total cost of \$1 million:

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The research and development projects funded through this request will be used to develop operational ocean and coastal observing platforms and products for Alaska's Arctic through the Alaska Ocean Observing System (AOOS).

Background

As the Alaska regional component of the national Integrated Ocean Observing System (IOOS), AOOS is a collaborative federal-state entity that facilitates partnerships across agencies and disciplines to meet the information and data needs of users of Alaska's coastal and ocean environment. The AOOS board (composed of the directors of the major federal and state resource agencies and research institutions in Alaska) has made improved monitoring and data collection of the Arctic's coastal waters one of its top priorities, largely due to the impacts seen in this region from climate change, and the challenges and potential opportunities that may arise from these impacts. However, a lack of specific tools is hampering some of those improvements to monitoring the Arctic.

Global climate modeling studies show the Arctic to be one of the region's most sensitive to climate change as shown by the recent extreme minima in sea ice extent and by the accelerated coastal erosion. The Arctic and Bering Sea subsistence coastal communities, whose lives depend on the seasonal cycle of sea ice, are particularly affected by climate change impacts, suffering coastal

erosion and inundation and the possible loss of subsistence resources such as polar bears, walrus and ice seals. However, reduced sea ice also creates opportunities for marine navigation and resource extraction, especially oil and gas, along with their associated environmental challenges. Minerals Management Service recently sold \$2.6 billion worth of oil and gas leases in the Chukchi Sea, in addition to the active offshore program in the Beaufort. Coastal communities in the Arctic are now seeing increased marine traffic, which poses increased risks for oil spills and accidents requiring search and rescue. Because of these challenges and opportunities, the US Coast Guard has renewed its interest in the Arctic and is planning to deploy personnel, aircraft and ships in the region as early as summer 2008.

The Need

Better forecasts of sea ice concentration and thickness and improved forecasts of nearshore marine conditions that affect navigation safety and forecasts of coastal erosion events are the critical needs in the Arctic. Better sea ice and marine forecasts will improve marine safety for subsistence use by Alaska Natives, and will be used by stakeholders from coastal communities and from industry for planning and operational purposes. Better predictions of erosion events will improve safety and reduce loss of property. What is missing to achieve these improvements is a suite of tools and products that can be used by the Coast Guard, the Army Corps of Engineers, and other federal and state managers and stakeholders to provide essential information for the Arctic.

Current seasonal sea ice forecasts are hampered by a lack of historical knowledge about past nearshore sea ice conditions, as well as inadequate sea ice thickness measurements. As the Arctic sea ice declines and new economic realities emerge such as oil and gas exploration and the possibility of economically-viable shipping, these activities are vulnerable to variations in fast ice conditions and ice thickness, and a nearshore climatology atlas and improved thickness measurements would help these sectors plan their future activities, as well as aid regulators such as the Coast Guard respond to emergency situations.

High-frequency radars (HFR) are commonly used along the coasts of the lower 48 to map the coastal circulation for purposes that include marine safety and navigation, pollution dispersal measurements, resource management, and ecosystem research. HFR application along these coasts is facilitated by the availability of large-scale power grids and easy access to sites. The application of HFR to Alaska's coasts is limited because these are largely uninhabited and thus lack access to a large-scale power grid. However, their potential use along the coasts of the Chukchi and Beaufort Seas is significant given the proposed offshore marine oil and gas activities anticipated there, current and potential marine shipping activities, and the migratory pathways for bowhead whales and other fish and wildlife species of concern.

Arctic climatology atlas

A contract will be issued to develop an atlas depicting mean climatologies of nearshore environmental parameters. The final product – an Arctic Ocean Environmental Database Atlas – will be available online. The atlas will be used to support development of nearshore forecasting capabilities and general operational guidance for use during both the ice and ice-free seasons. These data are needed by a multitude of entities in the Arctic, including the U.S. Coast Guard, Army Corps of Engineers, Minerals Management Service, US Department of Interior, National Weather Service, NOAA Fisheries, Alaska Department of Fish and Game, as well as coastal

communities and the Northwest Arctic and North Slope Boroughs, and the private sector, including the oil and gas and marine transportation industries.

Parameters to be captured in the atlas will include: annual fast ice formation and melt dates – means, variability, trends; monthly mean air and ocean temperature and trends; monthly mean and peak wind speeds and directions; monthly storm/high speed wind event counts; monthly mean wave state and coastal energy, frequencies for different sea wave height; monthly mean surface currents; and coastal surge frequencies and heights. Detailed knowledge about the state of sea ice and ocean conditions along the U.S. Arctic coastline will help objectively define areas most in need of improved forecasting of sea ice and other oceanographic parameters (waves, sea level, and currents). Data from the nearshore zone will describe the rate of climate change and establish times and extent of open water as the US Coast Guard prepares for increased shipping. The National Weather Service and AOOS will use the data to identify areas where additional observation platforms are needed in order to develop better nearshore (surf zone) weather forecasts. AOOS, NOAA, the State of Alaska, coastal communities, and the Army Corps of Engineers will be able to use the atlas data to develop a broadly-applicable coastal erosion forecast model and to assist with assessment of possible community relocation sites.

Sea ice thickness

Funds are requested to purchase an IcePic sensor from Geosensors, Inc. and an FAA approved mount to fit the helicopter, and to conduct the initial test flights. The sensor, which would be owned by the University of Alaska Fairbanks through AOOS, will be flown over sea ice and acquire thickness data based on the Electromagnetic (EM) field it creates. EM techniques have been widely used in recent years for ice thickness measurements employing airborne, ship-based and ground platforms and have been shown to be reliable, with thickness errors reduced to the order of 0.1 m or less. These measurements will establish what amount of the sea ice cover in the nearshore Beaufort Sea is now reduced to first year ice that will be lost each summer season. The thickness will make it clear just how much of the ice in the Beaufort Sea is thick enough to qualify as multi-year ice, which may have a chance of surviving the summer melt season. We are confident that with the initial purchase of this instrument, AOOS will be able to obtain funding to conduct the actual flights in subsequent years. In a prior proposal to the National Ocean Partnership Program, the oil and gas industry committed matching funds to assist with the effort.

Existing forecast models use multiyear sea ice concentration as a proxy for ice thickness to integrate into modeled ice thickness. Thickness is a proxy for age of sea ice, and age is a key factor in forecasting sea ice trends. Thickness is one of the highest priority measurement gaps in the Polar Regions identified by the National Research Council for NASA's Earth Science Enterprise Research Strategy. To bridge the gap between single point measurements from upward looking sonar, the coarse resolution of sea ice concentration from satellites, and the spatially limited data set from submarines, airborne measurements of sea ice thickness would be collected at the 10, 50, and 100 km scales. Airborne thickness data along all sampled lines will be compared with direct measurements from drill holes following flights, used to estimate the ice age and then compared with satellite drift estimates of age. Thickness data will be made available to the National Weather Service and the National Ice Center for their forecast models and via the AOOS web site. The AOOS data group will compare these data with the forecast

data. Measurements will be initially based from Barrow, Alaska, and then expanded along the Arctic coast.

High Frequency (HF) Surface Current Mapping Radars

In order for coastal forecasting to achieve the effectiveness and timeliness of weather forecasting and nowcasting, we need access to more densely distributed, near-real-time ocean surface current measurements. This is even more critical in remote portions of the Alaska coast. HFR surface current mapping is a proven technology widely used in the lower 48. It has been tested in Alaska in Prince William Sound, Cook Inlet and Prudhoe Bay. An intensive research and development project is needed to construct and test an autonomous powered and remotely-controlled system suitable for HFR applications that require power supplies of ~300W. Such a system has been designed for AOOS by the University of Alaska Fairbanks HF radar team, but funds are now requested to purchase equipment, assemble, test and integrate the various sub-systems and then test the integrated system in Seward, where it will be subjected to conditions characteristic of Alaska's sub-arctic maritime conditions. Seward is a logical place to conduct this test since it is easily accessible and skilled technical personnel are available to monitor and maintain the system. The ultimate goal is for AOOS to build HFR capacity within the state of Alaska in order to allow other users/operators to install, operate and maintain these systems in regions of interest.

The proposed system is specifically designed for both arctic and sub-arctic settings, although the basic system could be applied to any remote site, including those in mid-latitude and tropical regions. The Alaska HFR system has "moderate" electrical power requirements that fall within the "gray area" of remote power applications because the required load is greater than that at smaller monitoring sites, but much less than that needed for, say, large remote telecommunications sites. Commercially available "remote" power modules are unsuitable for one or more of the following reasons: inadequate battery bank capacity, incompatible with a high-latitude coastal setting, not portable, or lack the necessary monitoring, control, and communications features. Thus, there are no "off-the-shelf" systems that address design criteria for a remote, autonomous HFR installation.

The proposed system would include a modular power system that is portable enough to be installed and serviced from small cargo planes, boats, four-wheelers (ATVs), or snow machines with trailers. The system is designed to operate primarily on wind and solar power and secondarily on propane or diesel generators and it includes high-speed internet connectivity so that HFR and system status data is available in realtime. In particular, an assessment of wind data from Alaska's coasts suggests that the majority of coastal Alaskan sites can be classified (following the National Renewable Energy Laboratory's [NREL] nomenclature) as having "Outstanding" or "Superb" wind power potential. For all sites investigated (from Southeast Alaska to the Alaskan Beaufort Sea coast) 100% of the power needs for the HFR system can be obtained from two banks of nine 1.3 m² panels (although the optimal size will vary from site-to-site) and two wind turbines (of 2.5 m diameter). These generators maintain a battery bank (whose size and number are determined by the site and the measurement requirements). Consequently, powering a moderate-sized electrical load along Alaska's coasts is not only feasible but also practical and economical. Moreover, the system is designed to be easily configured for specific site characteristics and/or for available fuel types (wind, solar, propane, diesel, gasoline). The guiding principles behind the proposed HFR system design are that it be:

1. portable: no single component is heavier or larger than 2 people can carry;
2. flexible so that a site-specific system can be constructed in accordance with regulatory constraints and the availability of renewable energy; and
3. able to accommodate a 7.5KWH/day (>300W) power load.

Portability requires that the system be deployable at remote sites without expensive logistic support, including within or near remote villages (all of which are served by commercial air cargo carriers) or on remote islands or coasts accessible by vessel. System components are <200 lbs and sized for accommodation in skiffs, trailer-equipped 4-wheelers, or snow machines with a cargo sled.